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EXAMINER

MCDONOUGH, JAMES E

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

Original Rejection

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-20, 27-31 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sumi et al. (USP 6,323,353) in view of Baardman et al. (USP 5,658,982) in further view of Qian et al. "Synthesis and Polymerization Behavior of Various Substituted Half-Sandwich Titanium Complexes Cp'TiCl₂(OR*) as Catalyst for Syndiotactic polystyrene"; J. Mol. Cat.; 208; 2004, 45-54.

Sumi substantially discloses the invention as claimed (col. 2, 1. 56 to col. 3, 1. 50; col. 4, 1. 5, 1. 50; col. 10, 1. 20; col. 16, 1. 66 to col. 17, 1. 61, examples 14 and 15).

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Although, Sumi does not explicitly disclose the specific activators, Sumi does disclose the rest of the limitations of the claims. However, because Baardman teaches addition of tris(perfluorophenyl)borane greatly increase the rate of polymerization with catalyst (column 8, lines 42-46), it would have been prima facie obvious to someone of ordinary skill in the art at the time the invention was made to modify the teachings of Sumi, by including tris(perfluorophenyl)borane as the activator/co-catalyst/second catalyst, as suggested by Baardman.

The abstractable ligands in the primary reference are halogen, however, because Qian teaches in catalyst complexes used for polymerizing olefins that it is obvious to substitute halogen ligands for hydrocarbyl ligands and vice versa as it is known these changes will provide a change the activity of the catalyst and the properties of the polymer produced, it would have been prima facie obvious to someone of ordinary skill in the art at the time the invention was made to modify the teachings of the primary reference, by substituting halogen ligands for hydrocarbyl ligands, as suggested by Qian.

Claims 1-20, 27-31 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buchwald et al. (USP 6,307,087) in view of Baardman et al. (USP 5,658,982) in further view of Qian et al. "Synthesis and Polymerization Behavior of Various Substituted Half-Sandwich Titanium Complexes $Cp^*TiCl_2(OR^*)$ as Catalyst for Syndiotactic polystyrene"; J. Mol. Cat.; 208; 2004, 45-54.

Buchwald substantially discloses the invention as claimed (col. 7, 1. 5-44; col. 9, 1. 1-42; col. 25, 1. 63; col. 31, 1. 40 to col. 32, 1. 32; col. 33, 1. 56 to col. 34, 1. 16).

Although, Buchwald does not explicitly disclose the specific activators, Buchwald does disclose the rest of the limitations of the claims. However, because Baardman teaches addition of tris(perfluorophenyl)borane greatly increase the rate of polymerization with catalyst (column 8, lines 42-46), it would have been prima facie obvious to someone of ordinary skill in the art at the time the invention was made to modify the teachings of Buchwald, by including tris(perfluorophenyl)borane as the activator/co-catalyst/second catalyst, as suggested by Baardman.

The abstractable ligands in the primary reference are halogen, however, because Qian teaches in catalyst complexes used for polymerizing olefins that it is obvious to substitute halogen ligands for hydrocarbyl ligands and vice versa as it is known these changes will provide a change the activity of the catalyst and the properties of the polymer produced, it would have been prima facie obvious to someone of ordinary skill in the art at the time the invention was made to modify the teachings of the primary reference, by substituting halogen ligands for hydrocarbyl ligands, as suggested by Qian.

Claims 1-20, 27-31 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. (USP 6,525,210) in view of Baardman et al. (USP 5,658,982) in further view of Qian et al. "Synthesis and Polymerization Behavior of

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Various Substituted Half-Sandwich Titanium Complexes $\text{Cp}'\text{TiCl}_2(\text{OR}^*)$ as Catalyst for Syndiotactic polystyrene"; J. Mol. Cat.; 208; 2004, 45-54.

Zhang substantially discloses the invention (col. 3, 1. 25-45; col. 10, 1. 20-65; col. 11, 1. 1-55; col. 17, 1. 60; col. 21, 1. 7-25, 1. 51-62).

Although, Zhang does not explicitly disclose the specific activators, Zhang does disclose the rest of the limitations of the claims. However, because Baardman teaches addition of tris(perfluorophenyl)borane greatly increase the rate of polymerization with catalyst (column 8, lines 42-46), it would have been prima facie obvious to someone of ordinary skill in the art at the time the invention was made to modify the teachings of Zhang, by including tris(perfluorophenyl)borane as the activator/co-catalyst/second catalyst, as suggested by Baardman.

The abstractable ligands in the primary reference are halogen, however, because Qian teaches in catalyst complexes used for polymerizing olefins that it is obvious to substitute halogen ligands for hydrocarbyl ligands and vice versa as it is known these changes will provide a change the activity of the catalyst and the properties of the polymer produced, it would have been prima facie obvious to someone of ordinary skill in the art at the time the invention was made to modify the teachings of the primary reference, by substituting halogen ligands for hydrocarbyl ligands, as suggested by Qian.

Claim 40 is rejected as being unpatentable over any of Sumi (USP 6,323,353), Buchwald (USP 6,307,087), or Zhang (USP 6,525,210) in view of Baardman (USP

5,658,982) as applied to claims 1-20, 27-31 and 36-39 above in further view of Piekarski et al. (USP 3,991,259).

The disclosures of Sumi et al., Buchwald et al., Zhang et al., and Baardman et al. have been discussed above.

Neither Sumi, Buchwald, nor Zhang explicitly disclose the use of supports, however, because Piekarski teaches that the activity of many catalyst can be increased by depositing them on solid supports such as polymeric materials and refractory oxides (column 7, lines 18-48), it would have been prima facie obvious to someone of ordinary skill in the art at the time the invention was made to modify the above teachings, by incorporating a solid support, as suggested by Piekarski.

Response to Arguments

Applicant's amendments to claims 11 and 12 overcome the 112 rejections, therefore, the rejections have been withdrawn.

Applicants argue that it would not have been obvious to use an activator and the primary references fail to teach this. This is not persuasive because it is convenient to use activators/co-catalyst in polymerization catalyst and applicants have provided no reasoning that the skilled artisan would never be motivated to use an activator/co-catalyst unless it was specifically said it would work with a specific catalyst, many specific activators/co-catalyst can be used with several primary catalyst.

Applicants argue "Thus it is clear that using Applicant's specification as a map to cobble together something that appears to be applicants invention is not sufficient under 35 USC 103 to prove obviousness. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicants argue that the references teach certain types of catalysis such as carbon bond formation, and their catalyst is making oligomers and polymers, and that this is a fundamentally different way of doing chemistry. This is not persuasive for several reasons: 1.) Small molecule activation is not solely related to making small molecules 2.) Olefins and arguably oligomers are small molecules 3.) Olefin polymerization requires the forming of carbon-carbon bonds and the references teach reactions making carbon-carbon bonds 4.) If both are activating small molecules and both are forming carbon-carbon bonds it is requested an explanation how these are fundamentally different chemistries other than they can make different products which, would be completely expected when you use different substrates for the reaction.

Applicants argue against the references of Baardman and Quian individually. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants again argue that halogens carry a different charge than hydrocarbyl ligands. In metal chemistry this is flatly incorrect. For example let's compare lithium chloride with n-butyl lithium, these are both neutral compounds, however, since the lithium carries a +1 charge, the counter ions chloride and a butyl carbanion carry a -1 charge. Further, Diethyl zinc is Zn(II) not Zn(0). Metal alkyls can react with acidic protons to form a metal salt of the acidic compound and an alkane. Further, it is known that going from hydrogen to methyl, to primary carbon to secondary carbon to tertiary carbon the electron density on the metal through induction effects, further in going from hydrocarbyl to halogen and from iodine to bromine to chlorine to fluorine the electron density on the metal will decrease through induction based on the electronegativity of the group.

Applicants argue that in some systems an activator produces an inactive system and some times it produces an active system and so would not be obvious. This is not persuasive because it is known that sometimes an activator will produce a working

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system and sometimes it will not, there are only two possibilities here it works or doesn't, and if it works the activator will most likely improve the process, therefore it would have been obvious or "common sense" to try something that is well known to greatly benefit some catalyst systems, unless there is some reasoning not to combine such as incompatibility of the reagents.

Applicants argue that since the reference of Piekarski is using metals from a different group, one would not look to this for guidance. This is not persuasive and applicants are appearing to say that chemistry happens in a complete vacuum, which is far from the case. There are many trends (most are Lewis acids, catalyze reactions through their D-orbital's, their oxides are basic, typically follow the 16-18 electron rule, are cations preferably to anions, etc.) that follow in metals and the skilled artisan would indeed look to other metal groups for guidance in compounds even using another metal.

Applicants argue that it is not automatic that placing a catalyst on a support will increase the activity, as many systems will decrease in activity when placed on a support so the combination would not have been obvious. This is not persuasive because 1.) The skilled artisan only needs a motivation and a reasonable expectation of success, and since many systems will increase in activity when placed on a support (this is one of the reason to use a support other than recovery of catalyst), shows both the motivation and a reasonable expectation of success. So examiner statement is not "technically" incorrect as alleged by applicants.

Applicants request the examiner to provide support for the basic chemistry theories offered in support of the rejection. This is provided below:

- 1.) A copy of a page from examiner dissertation has been submitted as proof that reaction of a substrate can follow different pathways.
- 2.) Examiner can find no reference that teaches using common sense in catalysis, however, chemistry can be complex so it would appear obvious that one would want to use common sense when dealing with chemicals, if for no other reason than safety reasons (i.e. to prevent mixing of incompatible materials) and since chemistry is a building block science one would look to the literature and apply "common sense"
- 3.) This is explained above.
- 4.) This is explained above.
- 5.) This is explained above.
- 9.) See http://en.wikipedia.org/wiki/Ligand_field_theory which teaches that strong field ligands are those that can accept pi-electrons from the metal into an antibonding orbital on the ligand. Since neither halogens nor hydrocarbons have an orbital available for accepting the pi-electrons of the metal they are not strong field ligands.
- 10.) See <http://en.wikipedia.org/wiki/Ligand>, which, especially under strong and weak field ligands, which teaches that the ligand choice has a strong effect on all most all properties of the complex, and that these can be understood and predicted.
- 11.) This is explained above and based on the electron density of the metal center.

Applicants argue that the declaration submitted by Dr. Jo Ann Canich shows that the mixing of the references would poison the catalyst of the instant invention. This is not persuasive because it can not be found in the declaration any reasoning or teaching that the catalyst will be poisoned.

Applicants argue that if they were merely tuning the catalyst system it should make small molecules better, faster or cheaper. It would not make a completely different molecule. This is not persuasive because the only reason the references are making different molecules is because they are acting on different substrates.

Applicants argue against the double patenting rejection. Applicant's arguments are that this is the base application relative to application # 10/693,584 and as such request the withdrawal of the double patenting rejection. This is not persuasive because: 1.) The double patenting rejection is not the only remaining rejection present and 2.) Applicants have provided no evidence or reasoning that the instant application is the base application.

Applicants have submitted a declaration in support of non-obviousness.

Applicants argue that the ligand would not bind the metal in the way that it does in their invention. This is not persuasive because they are binding the same metal in the same oxidation state, and if the amino group binds to the metal in the instant invention it would also be expected to do so in the reference. Applicants talk about ligands 3-7,

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however it is noted that only one of the ligands is bidentate and this does not prove in any way that the metal will not coordinate the amino group.

Applicants argue that in scheme 1 of the reference to Fox involves a starting material of Pd(0) which is oxidized to Pd(II) and so this is different that the instant invention. This is not persuasive because Fox was not used in the rejections.

Applicants argue that in polymerization of olefins the metal does not shuttle between oxidation states as in some small molecule activations. This is true but the skilled artisan would be able to determine the mechanism of a catalytic cycle and known whether there was a need to shuttle between oxidation states.

Applicants argue that one skilled in the art would not add a polymerization activator with catalyst for small molecule activation. This is not persuasive as it is known that many catalyst can function in more than one type of catalytic cycle, and if one wanted to use the catalyst for polymerization there would be motivation to add an activator for polymerization, so as to help activate the catalyst for polymerization, as this is the reason polymerization activators are used.

Applicants offer opinions, but these are given little weight in a declaration.

Applicants argue that halogen ligands and hydrocarbyl ligands are not equivalent in all systems at all times. First examiner takes this as an admission by applicants that hydrocarbyl can be equivalent at some time in catalyst systems to halogen ligands and secondly applicants have not shown that in this case hydrocarbyl can not be replace by halogens to produce a functioning catalyst. Data showing equivalent catalyst differing in only the abstractable ligand (i.e. one with two halogens, one with a halogen and a

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hydrocarbyl, and one with two hydrocarbyls) ceasing to function or providing greatly different results that would be unexpected, would go a long way in helping to show a difference between the references and the instant invention and that this substitution provide unexpected and/or superior results. Further the fact that hydrocarbyl and halogen differ with borate activators is not relevant as the instant invention is not using borate activators.

Applicants argue that Quian is directed to polymerizing styrene and not alfa-olefins as in the instant invention. This is not persuasive because styrene is an alfa-olefin and this should be readily available to anyone working in polymerization catalysis.

Applicants argue that a fluorinated metallocene was 30-40 times greater in activity than the chloride derivative. This is expected as discussed above how a metal can be tuned by changing the electron density on the metal center.

Applicants argue that catecholate ligands behave differently than bromide ligands. This was never argued by the examiner. And it is expected that changing the leaving group will affect the catalyst, that is not the question, the question is whether that difference is unexpected.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES E. MCDONOUGH whose telephone number is (571)272-6398. The examiner can normally be reached on 8:30am-5:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571)272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jerry A Lorengo/
Supervisory Patent Examiner, Art Unit 1793

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